MOTORCYCLE JACK

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A report submitted in partial fulfilment of the requirements for the award of the degree of Diploma of Mechanical Engineering

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SUPERVISOR'S DECLARATION

I hereby declare that I have checked this project report and in my opinion this project is satisfactory in terms of scope and quality for the award of the degree of Diploma of Mechanical Engineering

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Date: 23 NOVEMBER 2009

STUDENT'S DECLARATION

I hereby declare that the work in this report is my own except for quotations and summaries which have been duly acknowledged. The report has not been accepted for any degree and is not concurrently submitted for award of other degree.

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ABSTRACT

These reports present about develop and make the motorcycle jack. This motorcycle jack is developing to ease for make maintenance toward motorcycle such as change engine oil, change tire and fork oil change and other. For make a motorcycle jack, it has many process included such as measuring process, cutting process, joining process, drilling process and painting process. This motorcycle made by adjusting and upgrades the motorcycle jacks that already have in market. This project also required analysis to ensure the strength and safety of the product meet the user need. To be confirm that the motorcycle jack safe and can be used, a stress analysis have be done to study about maximum stress. By using mild steel, it can be producing following the characteristic and specification.

ABSTRAK

Laporan ini membentangkan tentang projek untuk membuat motosikal jek. Motosikal jek ini dibuat untuk memudahkan kerja – kerja penyelenggaraan kecil terhadap motosikal seperti menukar minyak enjin, menukar tayar dan sebagainya. Untuk membuat motosikal jek ini, terdapat beberapa proses – proses yang terlibat seperti proses pengukuran, proses pemotongan, proses penyambungan, proses menebuk lubang dan proses mengecat. Motosikal jek ini dibuat dengan mengubah suai dan membaik pulih motosikal jek yang sudah berada dipasaran. Projek ini juga memerlukan analisis bagi memastikan kekuatan produk dan memastikan keselamatan pengguna dipenuhi sebetulnya. Untuk memastikan motosikal jek ini selamat dan dapat digunakan, satu analisis tentang tegasan telah dibuat untuk mengkaji berkenaan tegasan maksimum yang dapat ditampung. Dengan mengunakan besi lembut, motosikal jek ini dapat dihasilkan mengikuti kehendak dan memenuhi ciri – ciri yang dikaji.

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LIST OF SYMBOLS

σ	True stress, local stress (MPa)
$Ø$	Diameter (mm)
$_{cal}$	Local calculate stress (MPa)
$_{y}$	Local maximum stress (MPa)
%	Percent of value
A	Area of material (mm^2)
F	Force (N)
r	Radius of circle (mm)
N	Newton
kg	Kilogram
mm	Millimeter
kN	Kilo Newton
MPa	Mega Pascal

LIST OF ABBREVIATIONS

UMP	University Malaysia PAHANG
CAD	Computer Added Design
SMAW	Shielded Metal Arc Welding
MMA	Manual Metal Arc
CO_2	Carbon Dioxide
GMAW	Gas Metal Arc Welding
MIG	Metal Inert Gas
DC	Direct Current
EP	Electrode Positive
NC	Numerical Control
CNC	Computerized Numerical Control
PDS	Product Design Specification
BOM	Bill Of Material

CHAPTER 1

INTRODUCTION

This chapter will explain and contains about the project objective, problem statement, project scope, and the organization of the thesis.

1.1 OBJECTIVE PROJECT

Basically, this thesis would be done for fulfill the following:

i. To fabricate the motorcycle jack.

ii. To design the motorcycle jack.

1.2 PROBLEM STATEMENT

Many people had no idea how hard it would be to perform the most basic maintenance tasks on a motorcycle without centre stand. Easy projects like an engine oil or fork oil change, a chain lube, tire change or even cleaning the wheels are more difficult or, in some cases, nearly impossible without extra lifts, stands or jacks.

However, some of the motorcycles are come with centre stand. But not all have sufficient strength in order to manually locate the motorcycle using this centre stand.

1.3 SCOPE OF PROJECT

The scope of this project are :

i. This motocycle jack produce for motorcycle Yamaha RX-Z.

ii. Can accommodate and handle load below 150 kg.

iii. To design the suitable motorcycle jack using Auto CAD.

iv. It focus to develop and fabricate with using engineering method such as welding, drilling and other.

1.4 ORGANIZATION OF THE THESIS

This thesis have contains five chapter at overall. At Chapter 1 explain about the objective of project, problem statement of project and scope of this project. Beside that, at Chapter 2 will cover and explain about the type of motorcycle jack have exist in market, it also explain the specification of motorcycle Yamaha RX-Z, and history of the fabrication process. Chapter 3 will explain about the design of product, bill of material, and all of fabrication process well done in this project. At Chapter 4 will discuss about the analysis product such as cost analysis and stress analysis was carried out. And the last chapter will cover mainly about the conclusion of the project, it also have recommendation to improvement the product in the future.

1.5 CONCLUSION

In this chapter, we have clear objective and scope for develop project based on problem statement, beside that we can start a project and go the next step.

CHAPTER 2

LITERATURE REVIEW

This chapter will cover and explain about the research of the project and explain about the type of mechanical and hydraulic jack at market and method used. Beside that, specification of Yamaha RX-Z motorcycle aslo included here.

2.1 MOTORCYCLE JACK

A motorcycle jack includes a frame having front and rear cross shafts rotatable supported thereon. Pairs of front and rear legs are secured to opposite ends of the respective front and rear cross shafts for rotation in unison with the shafts. A linkage mechanism interconnects the front and rear shafts for rotation in unison, but in opposite directions so that the frame is raised in response to pivotal movement of the front and rear legs toward one another and is lowered in response to pivotal movement of the front and rear legs away from one another. A power unit is provided for rotating their legs relative to the frame. The cross shafts are preferably formed of a resilient material so that the free left legs tend to spread slightly further apart than the interconnected right legs, thereby tilting the motorcycle slightly to the left for placement onto its kickstand when the jack is lowered.

A mechanical jack is a device which lifts heavy equipment. The most common form is a car jack, floor jack or garage jack which lifts vehicles so that maintenance can be performed. Car jacks usually use mechanical advantage to allow a human to lift a vehicle by manual force alone. More powerful jacks use hydraulic power to provide more lift over greater distances. Mechanical jacks are usually rated for a maximum lifting capacity. The jack shown at the right is made for a modern vehicle and the notch fits into a hard point on a unit body. Earlier versions have a platform to lift on the vehicles' frame or axle. Figure 2.1 shown the basic mechanical jack and Figure 2.2 shown a double mechanical jack.

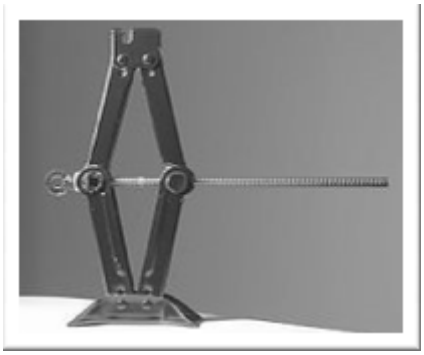

Figure 2.1: Mechanical Jack

Source: Wikipedia (2009)

Figure 2.2: Double Mechanical Jack

Source: Wikipedia (2009)

2.2 TYPE OF MOTORCYCLE JACK

2.2.1 Swingarm Motorcycle Jack

Featured on the swing arm stands shown in Figure 2.4 are rubber pads that rest on the swing arm and spool attachments for attaching to bikes with spools for even more stability. Included reversible rubber mounts adjust to fit almost any size swing arm. The rubber mounts also prevent swing arm scratches. The rubber swing arm mounts and spool attachments can be switched out in a flash with a spin of the adjustment knob. Heavy duty 1.5 inch tubing and dual 3 inch wheels on each side provide maximum stability for your motorcycle. The stands have a slightly raised

handle to keep from pinching your hands between the floor and handle when raising or lowering your bike. Use the motorcycle swing arm stand to service your sport bike or dirt bike, or to keep from getting flat spots on your rear tire. The motorcycle stand only weighs 10LBS and can adjust to fit widths from 8 inch to 13.5 inch which will accommodate almost any dirt bike or sport bike. Figure 2.3 shown how to use the motorcycle swing arm stand.

Figure 2.3: Using Motorcycle stand

Source : eHardware2u (2008)

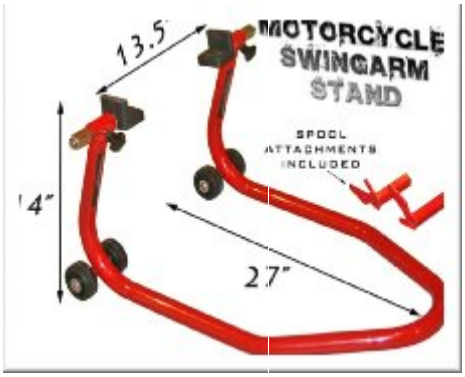

Figure 2.4: Motorcycle Swingarm stand

Source : eHardware2u (2008)

2.2.2 Bottle Jack

Bottle jacks as shown in Figure 2.5 are hydraulic jacks that are placed in a horizontal position. These jacks push against a lever, which lifts the main lift arm. Bottle jacks have a longer handle than most hydraulic jacks, however, and it is possible to get more lift per stroke with the increased leverage they provide when compared to regular models of jacks. Mechanics and construction workers building or repairing home foundations prefer to use bottle jacks.

Bottle jacks are versatile because their horizontal position makes it possible to place them in tight spots and provides good leverage. In recent years, bottle jacks have proven useful in search and rescue missions following earthquake damage. As a result, bottle jacks are standard equipment in firehouses and for search and rescue

teams. This life-saving purpose is a use manufacturers had not expected from bottle jacks.

Bottle jacks are also used for lifting, spreading, bending, pushing, pressing, or straightening requirements. Newer bottle jacks have undergone some slight design changes, including chromed pump pistons and rams to provide for added rust resistance. The base and cylinders of bottle jacks are electrically welded for strength, and all models are capable of working in upright, angled, or horizontal positions.

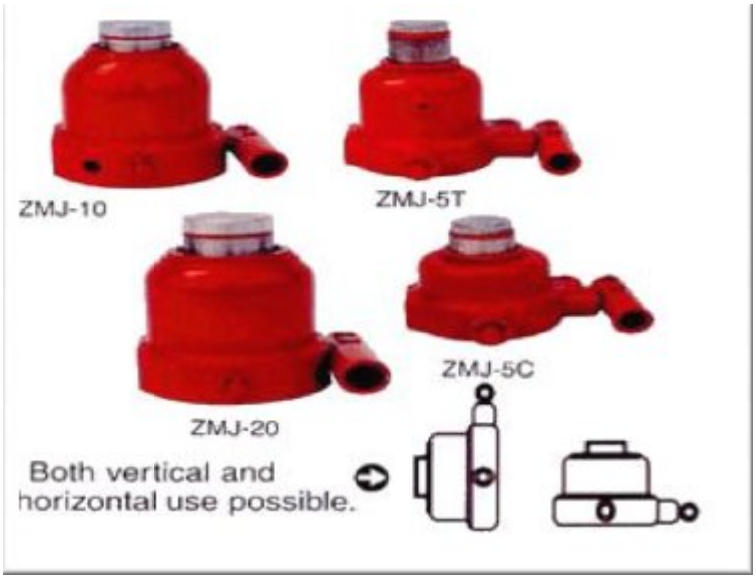

Figure 2.5: Zinko Mini Bottle Jack

Source : Hydraulic Jacks Home Page (2009)

2.2.3 Motorcycle Jack Stand

Motorcycle jack stand usually use as a suport stand for the motorcycle and car after it has jack which other divice. Figure 2.6 shown that ratchet jack stand refer with many specification in the market. It can make a jack safety during a process jack up a motorcycle or other. Figure 2.7 below shown the specification for ratchet jack stand

Figure 2.6: Ratchet Style Jack Stand

Source : Hydraulic Jacks Home Page(2009)

TONS	LOW HEIGHT	MAX HEIGHT	HHT. INTER-VALS	BASE	MODEL	LBS. PAIR
3	12"	17 1/2"	9/16"	7 1/2" by 7 7/8"	81004C	19
6	16 1/4"	24 7/8"	5/8"	10 1/16" by 11 1/16"	81006D	30
12	19 5/8"	29 3/8"	1 1/4"	13" by 15"	81012	86

Figure 2.7: Specification of Ratchet Jack Stand

Source : Hydraulic Jacks Home Page (2009)

2.3 MOTORCYCLE SPECIFICATION

Yamaha RX-Z 135 shown in Figure 2.8 is a 2-stroke naked bike manufactured by Yamaha Motor Corporation. Debuted in 1987, the RX-Z is very popular in Malaysia and Singapore and enjoys one of the longest current motorcycle product life in both countries, especially in Malaysia due to the absence of other street bike competitors to date. In 2004, the model was face lifted and a catalytic converter was installed. **Appendix B** has shown the detail specification of Yamaha RX-Z motorcycle.

Figure 2.8: Motorcycle Yamaha RX-Z

2.4 WELDING MACHINE

Welding is a fabrication or sculptural process shown in Figure 2.9 that joins materials, usually metals or thermoplastics, by causing coalescence. This is often done by melting the work pieces and adding a filler material to form a pool of molten material the weld pool that cools to become a strong joint, with pressure sometimes used in conjunction with heat, or by itself, to produce the weld. This is in contrast with soldering and brazing, which involve melting a lower-melting-point material between the work pieces to form a bond between them, without melting the work pieces.

Figure 2.9: Welding Process

Source : Wikipedia (2009)

2.4.1 Process Of Arc Welding

One of the most common types of arc welding is Shielded Metal Arc Welding (SMAW), which is also known as Manual Metal Arc Welding (MMA) or stick welding. Electric current is used to strike an arc between the base material and consumable electrode rod, which is made of steel and is covered with a flux that protects the weld area from oxidation and contamination by producing Carbon Dioxide (CO_2) gas during the welding process. The electrode core itself acts as filler material, making separate filler unnecessary.

The process is versatile and can be performed with relatively inexpensive equipment, making it well suited to shop jobs and field work. An operator can become reasonably proficient with a modest amount of training and can achieve mastery with experience. Weld times are rather slow, since the consumable electrodes must be frequently replaced and because slag, the residue from the flux, must be chipped away after welding. Furthermore, the process is generally limited to welding ferrous materials, though special electrodes have made possible the welding of cast iron, nickel, aluminum, copper, and other metals. Inexperienced operators may find it difficult to make good out-of-position welds with this process.

2.4.2 Process Of MIG Welding

Gas Metal Arc Welding (GMAW), also known as Metal Inert Gas or (MIG) welding, is a semi-automatic or automatic process that uses a continuous wire feed as an electrode and an inert or semi-inert gas mixture to protect the weld from contamination. As with SMAW, reasonable operator proficiency can be achieved with modest training. Since the electrode is continuous, welding speeds are greater for GMAW than for SMAW. Also, the smaller arc size compared to the shielded metal arc welding process makes it easier to make out-of-position welds e.g. overhead joints, as would be welded underneath a structure.

The MIG process show in Figure 2.10 uses a Direct Current (DC) power source, with the Electrode Positive (EP). By using a positive electrode, the oxide layer is efficiently removed from the aluminum surface, which is essential for avoiding lack of fusion and oxide inclusions. The metal is transferred from the filler wire to the weld bead by magnetic forces as small droplets, spray transfer. This gives a deep penetration capability of the process and makes it possible to weld in all positions. It is important for the quality of the weld that the spray transfer is obtained.

There are two different MIG welding processes, conventional MIG and pulsed MIG. Conventional MIG uses a constant voltage DC power source. Since the spray transfer is limited to a certain range of arc current, the conventional MIG process has a lower limit of arc current or heat input. This also limits the application of conventional MIG to weld material thicknesses above 4 mm. Below 6 mm it is recommended that backing is used to control the weld bead. Pulsed MIG uses a DC power source with superimposed periodic pulses of high current. During the low current level the arc is maintained without metal transfer. During the high current pulses the metal is transferred in the spray mode. In this way pulsed MIG is possible to operate with lower average current and heat input compared to conventional MIG. This makes it possible to weld thinner sections and weld much easily in difficult welding positions.